

The Eltham Copper Butterfly *Paralucia pyrodiscus lucida* Crosby (Lepidoptera: Lycaenidae): local versus state conservation strategies in Victoria

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Abstract

This paper summarises some aspects of the practical conservation needs of the Eltham Copper Butterfly *Paralucia pyrodiscus lucida*, a small threatened subspecies of butterfly endemic to Victoria, Australia. The butterfly is located in three disjunct regions, separated by hundreds of kilometres across the state as a result of habitat removal and degradation. The three areas of ECB occurrence each have distinct characteristics affecting the needs and intensity of conservation management on the various sites given their urban, regional and rural settings. Butterfly populations have been monitored nearly every year since 1988 with the active support of volunteers, 'Friends of Eltham Copper Butterfly', local councils and government agencies. This information has contributed to a more holistic management regime for the butterfly, and further research aims to elucidate the more intricate details of the butterfly's biology, to continue to refine the current monitoring process across the state of Victoria. (*The Victorian Naturalist* 124 (4), 2007, 236-242)

Introduction

The Eltham Copper Butterfly *Paralucia pyrodiscus lucida* Crosby (ECB) is a Victorian endemic subspecies of the dull copper. In common with many other Australian Lycaenidae, it has declined in range, and has become one of the best-known butterfly taxa in Victoria since a thriving colony was discovered in Eltham, outer Melbourne, in 1987. Before that, it had been believed by many people to have become extinct through site loss caused by urban development since it was described from Greensborough in 1951. ECB was amongst the first invertebrates to be listed under the *Flora and Fauna Guarantee Act* 1988, and has become a powerful ambassador for insect conservation in the state. It is one of few Australian butterflies for which dedicated reserves have been designated for its conservation. The butterfly's biology, outlined by Braby (1990) and Braby *et al.* (1992, 1999), is reasonably well understood. Endersby (1996) also contributed to the biology and behaviour of ECB with detailed field observations of each of its life history stages. The senior author of this paper is currently completing more detailed research on the ECB as part of a higher degree dissertation. Caterpillars feed nocturnally on *Bursaria spinosa*, and are tended by ants of the genus *Notoncus*. They are harboured in the ant subterranean

nests by day, around the base of the food plant. ECB is unusual in that populations have been monitored nearly every year since 1988 with the active support and participation of community volunteers, such as the 'Friends of the Eltham Copper', and parallel groups associated with reserves in Castlemaine and Kiata. With their help, counts have been made both of caterpillars and adult butterflies each season.

In this note, we summarise some aspects of the practical conservation needs of the subspecies, and draw attention to (a) differences between the management needs of ECB in three disjunct regions in which the butterfly occurs and (b) differences between the various sites in the Eltham area, for which different agencies have primary management responsibility. Early conservation management plans and status evaluations (Crosby 1987; Vaughan 1988) have continued to form the basis for more recent advances, and enabled progress toward more holistic management. The conservation of the ECB is overseen by the Eltham Copper Butterfly Working Group, which comprises representatives of the various management agencies for the different ECB sites, entomologists, scientists from other relevant disciplines, and the relevant Friends groups.



Fig. 1. The Eltham Copper Butterfly locations at Kiata. The Kiata Flora Reserve has two sites, one by the highway (1) and the other in the centre of the reserve (2). There is a small colony at the Salisbury Flora Reserve (3).

Distribution and its conservation implications

The current distribution of the Eltham Copper Butterfly is believed to represent the outcome of considerable range reduction and habitat loss and fragmentation, to leave three highly disjunct areas where the butterfly now occurs (Figs. 1–3). Within each region, the butterfly exhibits characteristic patterns of seasonal development, and within each the distribution is patchy and far less extensive than that of either the larval food plant or the host ant. Phenology and development differs somewhat in the different regions, reflecting climatic differences, and leading to different monitoring needs in each area. At Eltham, a clear univoltine pattern occurs, but with late emergences of adults in some years giving the appearance of a second generation. Adults are present from November to March, occasionally later. Eggs are laid from November, and young caterpillars eclose in December, foraging little during the winter months but resuming regular activity as the weather warms in early

spring. In contrast, two distinct generations occur in the Kiata area, where adults of the first generation appear from mid-October, and of the second generation, in February. Phenology at Castlemaine also implies that only one generation may occur. Different species of *Notoncus* host the caterpillars in different parts of the range: *N. capitatus* at Eltham and Castlemaine, and *N. ectatomoides* at Kiata.

The three areas of ECB occurrence each have distinct characteristics affecting the needs and intensity of conservation management on the various sites.

- Kiata and Salisbury, in north-western Victoria, harbour populations on several rural sites with patchy *Bursaria*, within a largely pastoral area. Three small colonies of the butterfly are known on large flora reserves (Fig. 1).
- Castlemaine. Two peri-urban sites support butterfly colonies, one within the Botanic Gardens, and others, more recently discovered, in Kalimna Park. These sites represent an urban/rural transition, and are surrounded by a mix-



Fig. 2. The Eltham Copper Butterfly sites at Castlemaine are located in the Botanic Gardens and in Kalimna Park (3 and 4). The population at the Botanic Gardens has moved from 1 to 2 since monitoring began.

ture of residential development, natural bushland and grazing lands with ongoing subdivision for urban development (Fig. 2).

- (c) Eltham/Greensborough, in outer north eastern Melbourne, where the butterfly occurs on several small (1-3 ha) urban remnant patches, surrounded and isolated by housing. Six major colonies are known, some of them small (Fig. 3). The largest population, at the Western Colony, comprises fewer than 800-1000 individuals.

All sites are nominally protected, some as dedicated reserves, and some by being

within reserves with wider conservation responsibility. The sites thereby span the range from large rural sites to small urban ones. These are associated with different threats and different opportunities for the butterfly to disperse and track resources. Thus the larger sites afford opportunity for population movement impossible on the small Eltham sites.

Systematic annual larval and adult counts have been made at all three locations since 1993. These have been conducted by professional entomologists (Van Praagh 1996; Canzano, unpubl. data), Department of Sustainability and Environment, Parks

Victoria, and the Friends groups (Friends of the Eltham Copper Butterfly and Friends of Kalimna Park). These annual counts have provided significant information on distribution and relative abundances of ECB, but the nature, intensity and frequency of counts required to provide reliable quantitative data on ECB in these reserves remains uncertain. The results are influenced by weather conditions and differences in individual observer acuity.

Progress toward effective conservation

As for other butterflies in Victoria, surveys continue to yield new information, both of detail and scale, with recent discoveries of 'new' colonies in Kalimna Park of considerable interest. Only through community awareness can such events be effectively documented and publicised. ECB conservation is broadly overseen by a statewide management group, with representation from all range areas, state and municipal agencies, and independent scientists, and

which acts as a clearing house and coordinator of information accruing. Management needs, and the capacity to undertake effective management, differ substantially across the different areas. At Kiata/Salisbury and Castlemaine the potential habitat and sites are sufficiently extensive to facilitate a mosaic of conditions within the area, and for the butterfly populations to track these as they change, so that the butterfly presence and distribution may differ from year to year, or across a longer time scale. Thus, the major colony in the Castlemaine Botanic Gardens has moved from its stronghold in the early 1990s to another site some hundreds of metres away. Such microscale population movements are by no means unusual in butterflies as conditions change, with some species surviving continuously in a suite of habitat patches, only some of which are occupied at any time, on a site and with the population sustained through a series of 'colonisation-extinction-recolonisation'



Fig. 3. The Eltham Copper Butterfly sites at Greensborough (1) and Eltham (2-6). The Greensborough site is Yandell's Reserve, while the Eltham sites are the Pauline Toner Reserve (2), the Western colony (3), the Eastern colony (4), the former Yarra Valley Water land (5) and Hohne's Hill (6). The Pitt St Reserve is on the south side of Pitt St adjacent to the Pauline Toner Reserve.

sequences across the landscape: part of the system constituting a possible 'metapopulation' structure. This may be particularly pronounced at Kiata/Salisbury, where the *Bursaria* is very patchy on the sites, and movement between food plant patches (which are also a nectar source for adults) is necessary.

In contrast, this process and population structure is thwarted on small sites. At Eltham, for example, there seems little, if any, chance that butterflies can disperse between the major site-based colonies, because the intervening terrain is highly altered to comprise houses and roads, so that all population processes have to occur (and be sustained) within the confines of single small sites, each of which harbours a discrete population. There is currently little or no opportunity for genetic exchange between those demographic units. Mark-release-recapture studies have not shown exchange of individuals between colonies. However, enhancement of habitat connectivity through carefully planned revegetation of roadside verges and residential properties with the host plant, to allow for 'corridors' for the butterfly, may thereby facilitate movement between habitat patches. Undiscovered colonies may still occur, even in the highly urbanised Eltham location, where additional dedicated reserves for the ECB have been identified over the last five years. These include a block at Pitt Street at the top end of the Pauline Toner Reserve (Yen 2002) and the Yarra Valley Water property that abuts the Eastern Colony. It may be possible to 'link' some of these Eltham reserves with appropriate planting of *Bursaria* in private gardens between them. Management must thus focus on sustaining critical resources in exploitable form in the same small areas, rather than in a wider landscape mosaic, and must therefore counter natural processes (such as succession) to a greater extent than on larger sites.

The underlying ecological differences between the larger and smaller sites dictate in part the nature of threats and the emphasis of alleviative management. Management is necessarily more intensive on small sites, to counter ecological processes and the more proximal anthropogenic threats wrought by edge effects on

small areas and by urbanisation on essentially isolated populations. Factors such as runoff, rubbish dumping, weed invasion, vandalism and general human traffic contribute severally and collectively to habitat degradation. Issues of human concern from neighbouring residents also occur. For example, accumulation of fuel on the sites is perceived to increase the risks of wildfire to property. Many of these anthropogenic effects are of minimal importance on the more rural sites, in the context of sustaining critical resources for the butterfly. At Kiata, encroachment of agricultural crops on to ECB habitat, and rabbit/hare grazing on *Bursaria* are concerns. At Castlemaine, activities such as trail-bike riding have caused some concerns at Kalimna Park, in addition to weed invasion and rabbit grazing.

Differences in site scale are linked with threat intensity. Almost inevitably, details of the management needed are site-specific, but the additional implication is that on very small sites, the butterfly is 'conservation dependent' and that continuing management on each site is necessary and must be assured. Long term agency commitment is therefore needed, and can be very difficult to obtain, despite considerable goodwill. Elsewhere, more sporadic management to address particular threats may be a less intensive (i.e. cheaper) but viable option. Again, the interest of individual people is a vital component of ensuring effective monitoring and management of these sites. At all sites, monitoring is a fundamental component of assessing management need by tracking changes as they occur and adapting management accordingly. For example, grazing of *Bursaria* by hares at Kiata led to the erection of fencing to protect critical bushes. Vehicular tracks at Kalimna Park have been blocked or rendered inaccessible to casual visitors. Continuing management needs around Eltham include:

- (a) control of exotic weeds and maintenance or enhancement of *Bursaria*;
- (b) maintenance of conditions suitable for *Notoncus*;
- (c) prevention of overshadowing, for example by canopy closure;
- (d) removal of fallen debris, as a fuel reduction measure;

- (e) minimising inappropriate inputs, such as diverted water runoff, into the reserves;
- (f) undertaking any such measures in concert with conservation needed for other significant species on each site;
- (g) continuing to foster interest of local people in the conservation process, through volunteer programmes and education.

Other management measures include coppicing of old *Bursaria* to promote fresh growth, enhancement of *Bursaria* by planting (using plants from local seed stocks), and hand removal of weeds (particularly on sites where rare orchids and other plants occur). The last is important on a few sites, on which even moderate human trampling pressure or less sensitive control measures such as herbicide use could prove harmful.

Some such management has been highly experimental, even risky, as with the decision to burn two major butterfly sites (the 'Western Colony' and 'Eastern Colony') at Eltham to 'rejuvenate' them and help reduce canopy closure and weed populations. Such drastic intervention was considered necessary as the major avenue to counter continuing decline in site quality, and in site capacity to host the butterfly (New *et al.* 2000). A 'hot fire' in April 1998, a time when the caterpillars were already present and moderately grown, involved numerous people and fire brigade units, and also involved considerable risk to the butterfly population, but was endorsed on the grounds that should the site become inhospitable that population was in any case doomed. Needs for planning the burn were for it to be as hot as possible (to open canopy and destroy exotic weed seedbanks), as late in the summer as possible (to allow caterpillars maximum feeding time before their food supply was lost), during the day (when caterpillars are underground so not exposed directly to the flames and heat), undertaken only under 'safe' weather conditions, and to extend over much of the site, except for small damped down areas in which caterpillars were particularly abundant. Most caterpillars indeed survived, and the ensuing adult population was not conspicuously diminished.

Timing and intensity of all management is informed by monitoring of the butterfly, both as adults and caterpillars. Intensive monitoring was initiated by Van Praagh (1996), augmented by some student projects on coppicing of *Bursaria spinosa* by the Eltham Copper butterfly (Carroll *et al.* 1998) and observations on larval feeding behaviour as well as germination of *Bursaria spinosa* seeds (O'Sullivan *et al.* 1999). Recent studies on caterpillar mobility, feeding behaviour and frequency, and adult dispersal involving marking individuals and tracking them in their environments (Canzano, unpubl. data) are aiding refinement of the monitoring process, and may help to reduce some of the current uncertainties over interpretations of inter-generational changes in numbers (Johnson 2002) and increase predictive capability. Such recent biological insights will feed directly into a refined plan for conservation of the Eltham Copper, in which the biological differences and opportunities in the different sectors of its range will be treated both individually and in concert for a more holistic overview of management for its future. Without them, or without appreciating the influences of the different sites on the butterfly's potential for survival, management may be severely impoverished through inadequate ecological focus. A prime purpose of the Eltham Copper Butterfly Working Group is to address such issues, and to hone management so that the best possible options are understood and available, both now and for application in the future, perhaps to additional populations should they be discovered or founded deliberately. Whilst these notes have been confined to field populations, a captive breeding programme for the butterfly is also contemplated by the Melbourne Zoo, as an investment in the future of this notable Victorian insect. Further research on the ECB is necessary because of the need for information on the biology and ecology of *Notoncus* ants in relation to the ECB, the genetics of the ECB, and ECB-*Bursaria* interactions to assist its conservation.

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One hundred and One Years Ago

Mr F.G.A. Barnard made some remarks on the larvae and perfect beetles of the Golden Beetle, *Lamprima rutilans*, which he had recently taken from a red gum verandah post at Kew. The post had been in its present position for more than twenty years, and therefore the larvae of the beetle must have got into it since it was placed in its present position. Over twenty larvae and perfect beetles were obtained, the larvae resembling very closely those usually regarded as the larvae of the Cuckchafer, *Anoplognathus*, sp. The perfect beetles were all of small size, but very highly coloured.

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